CLAIMS

I claim as deserving the protection of United States Letters Patent:

1. A method for three-dimensional shape and size measurement of a three-dimensional body surface comprising the steps of:

providing a three-dimensional scanner;

providing a processor;

providing a three-dimensional Computer Aided Design system;

scanning in three dimensions with the three-dimensional scanner at least a portion of the three-dimensional body surface;

creating a data file representative of the three-dimensional body surface;

processing the data file with the processor;

importing the data file into the three-dimensional Computer Aided Design System;

employing the three-dimensional Computer Aided Design System relative to the data file to define and record three-dimensional measuring data relative to at least a portion of the three-dimensional body surface; and

employing the three-dimensional Computer Aided Design System to exploit the three-dimensional measuring data.

2. The method of claim 1 wherein the step of processing the data file with the processor comprises aligning captured 3D XYZ point cloud data sets, patching areas with missing 3D XYZ point cloud data, and filtering and deleting noisy data.

3. The method of claim 2 wherein the step of processing the data file with the processor

further comprises merging the data to create a polygonal mesh of the three-dimensional body surface.

4. The method of claim 1 wherein the steps of creating a data file representative of the three-dimensional body surface and processing the data file with the processor are dependent in detail on fit requirements of a garment.

5. The method of claim 4 wherein the fit requirements of the garment comprise a loose fit requirement and a tailored fit requirement.

6. The method of claim 1 wherein the step of employing the three-dimensional Computer Aided Design System relative to the data file to define and record three-dimensional measuring data relative to at least a portion of the three-dimensional body surface comprises defining at least one girth shape with a planar section of the three-dimensional body surface.

7. The method of claim 6 wherein the step of defining at least one girth shape with a planar section comprises defining a plurality of girth shapes with planar sections of the three-dimensional body surface.

8. The method of claim 7 wherein the step of defining at least one girth shape with a planar section further comprises determining a center point of each of at least some of the plurality of girth shapes.

9. The method of claim 8 wherein the step of determining the center point of each of at least some of the plurality of girth shapes comprises determining opposing extreme points of each girth shape in at least two perpendicular orientations, connecting the extreme points with lines comprising an X dimension line and a Y dimension line, and defining where the lines intersect to be the center point.

10. The method of claim 9 further comprising defining a plurality of girth plane perimeter curve definition control points along a perimeter of the girth plane between the opposing extreme points of the girth shape, determining a distance between each of the plurality of girth plane perimeter curve definition control points and the center point, and determining an angular orientation of a line between each of the plurality of girth plane perimeter curve definition control points and the center point whereby the girth shape can be recreated.

11. The method of claim 9 further comprising determining a relative location of a center point of a first girth shape relative to a center point of a second girth shape.

12. The method of claim 11 wherein the step of determining the relative location of the center point of the first girth shape relative to the center point of the second girth shape comprises determining a distance between the center points of the first and second girth shapes and determining an angular orientation of a line connecting the first and second girth shapes whereby relative locations of the first and second girth shapes can be recreated.

13. The method of claim 7 wherein the step of defining a plurality of girth shapes with planar sections of the three-dimensional body surface includes defining a hip girth whereby the hip girth can be used as a reference plane.

14. The method of claim 1 wherein the step of employing the three-dimensional Computer Aided Design System relative to the data file to define and record three-dimensional measuring data relative to at least a portion of the three-dimensional body surface comprises adding three-dimensional shape definition points to the three-dimensional body surface for identifying and defining measurement guidelines and landmarks

15. The method of claim 14 wherein the step of employing the three-dimensional Computer Aided Design System to exploit the three-dimensional measuring data comprises employing the three-dimensional Computer Aided Design System to create garment patterns.

16. The method of claim 15 wherein the step of employing the three-dimensional Computer Aided Design System to create garment patterns comprises creating reference points that are spaced from the three-dimensional shape definition points on the three-dimensional body surface, creating three-dimensional curve lines using the reference points, and forming three-dimensional garment pattern pieces using the three-dimensional curve lines.

17. The method of claim 16 wherein the step of employing the three-dimensional Computer Aided Design System to create garment patterns comprises creating automatic custom-made garment patterns by employing pre-selected spatial relationships between the three-dimensional garment pattern pieces and the three-dimensional shape definition points to adjust locations of the reference points automatically to maintain the pre-selected spatial relationships in response to changes in locations of the three-dimensional shape definition points.

18. The method of claim 17 wherein the step of employing the three-dimensional Computer Aided Design System to create garment patterns further comprises unwrapping/flattening the three-dimensional garment pattern pieces into two-dimensional garment pattern pieces.

19. The method of claim 18 further comprising sending information regarding the 2D pattern pieces to a fabric cutter.

20. A method for employing 3D relational geometry for automatic pattern making comprising the steps of:

providing a three-dimensional Computer Aided Design system;

providing a data file representative of a three-dimensional body surface;

providing a library of three-dimensional pattern parts;

importing the data file and the library of three-dimensional pattern parts into the three-dimensional Computer Aided Design System;

employing the three-dimensional Computer Aided Design System relative to the data file and the library of three-dimensional pattern parts to define and record three-dimensional measuring data relative to at least a portion of the three-dimensional body surface and the library of three-dimensional pattern parts; and

employing the three-dimensional Computer Aided Design System to create a three-dimensional pattern from the three-dimensional measuring data and the library of three-dimensional pattern parts.

21. The method of claim 20 wherein the step of employing the three-dimensional Computer Aided Design System relative to the data file and the library of three-dimensional pattern parts comprises adding three-dimensional shape definition points to the three-dimensional body surface and the library of three-dimensional pattern parts for identifying and defining measurement guidelines and landmarks

22. The method of claim 21 wherein the step of employing the three-dimensional Computer Aided Design System to create three-dimensional patterns comprises employing pre-selected spatial relationships between the three-dimensional body surface and the library of the three-dimensional parts to maintain the pre-selected spatial relationships in response to changes in a shape and size of the three-dimensional body surface and in response to changes in a shape and size of elements of the library of three-dimensional pattern parts.

23. The method of claim 22 further comprising unwrapping/flattening the three-dimensional

pattern into two-dimensional patterns.

24. The method of claim 23 further comprising sending information regarding the 2D pattern pieces to a fabric cutter.

25. The method of claim 22 further comprising establishing fit zones between the three-dimensional body surface and the three-dimensional pattern.

26. The method of claim 25 further comprising providing a depiction of the fit zones.

27. The method of claim 20 wherein the step of employing the three-dimensional Computer Aided Design System relative to the data file and the library of three-dimensional pattern parts to define and record three-dimensional measuring data relative to at least a portion of the three-dimensional body surface and the library of three-dimensional pattern parts comprises defining at least one girth shape with a planar section of the three-dimensional body surface.

28. The method of claim 27 wherein the step of defining at least one girth shape with a planar section comprises defining a plurality of girth shapes with planar sections of the three-dimensional body surface.

29. The method of claim 28 wherein the step of defining at least one girth shape with a planar section further comprises determining a center point of each of at least some of the

plurality of girth shapes.

30. The method of claim 29 wherein the step of determining the center point of each of at least some of the plurality of girth shapes comprises determining opposing extreme points of each girth shape in at least two perpendicular orientations, connecting the extreme points with lines comprising an X dimension line and a Y dimension line, and defining where the lines intersect to be the center point.

31. The method of claim 30 further comprising defining a plurality of girth plane perimeter curve definition control points along a perimeter of the girth plane between the opposing extreme points of the girth shape, determining a distance between each of the plurality of girth plane perimeter curve definition control points and the center point, and determining an angular orientation of a line between each of the plurality of girth plane perimeter curve definition control points and the center point whereby the girth shape can be recreated.

32. The method of claim 30 further comprising determining a relative location of a center point of a first girth shape relative to a center point of a second girth shape.

33. The method of claim 32 wherein the step of determining the relative location of the center point of the first girth shape relative to the center point of the second girth shape comprises determining a distance between the center points of the first and second girth shapes and determining an angular orientation of a line connecting the first and second girth shapes whereby relative locations of the first and second girth shapes can be

recreated.